



Pacific Northwest  
NATIONAL LABORATORY

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# COMcheck™ Basics

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U.S. Department of Energy Building Energy Codes Program  
Energy Codes Commentator Webinar Series

AIA Provider #: I014

AIA Course #: BECPWSJ16

June 9, 2016



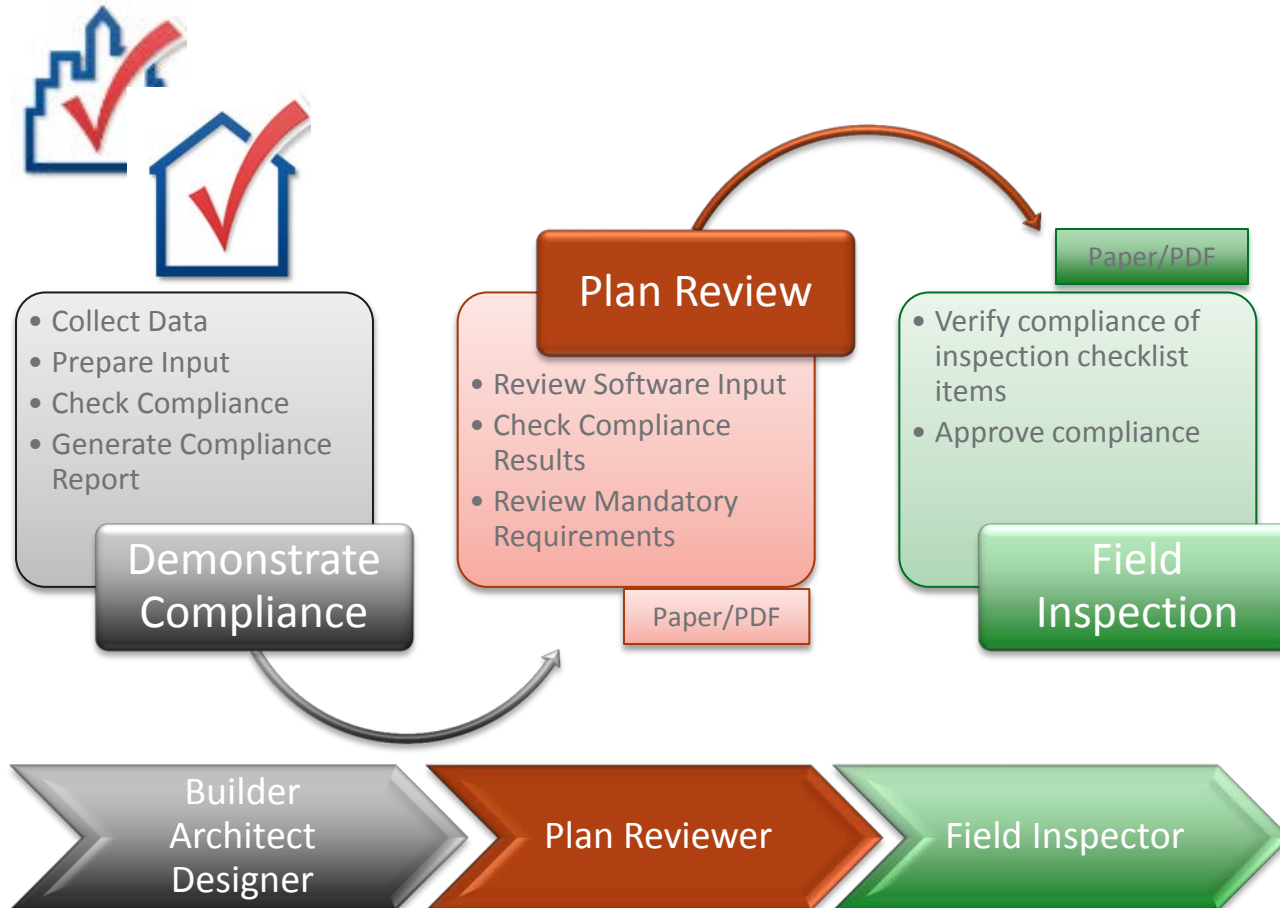
# Course Description and Learning Objectives

Basics of using the *COMcheck* software, reviewing generated compliance reports, and the latest and greatest new features.

## Learning Objectives:

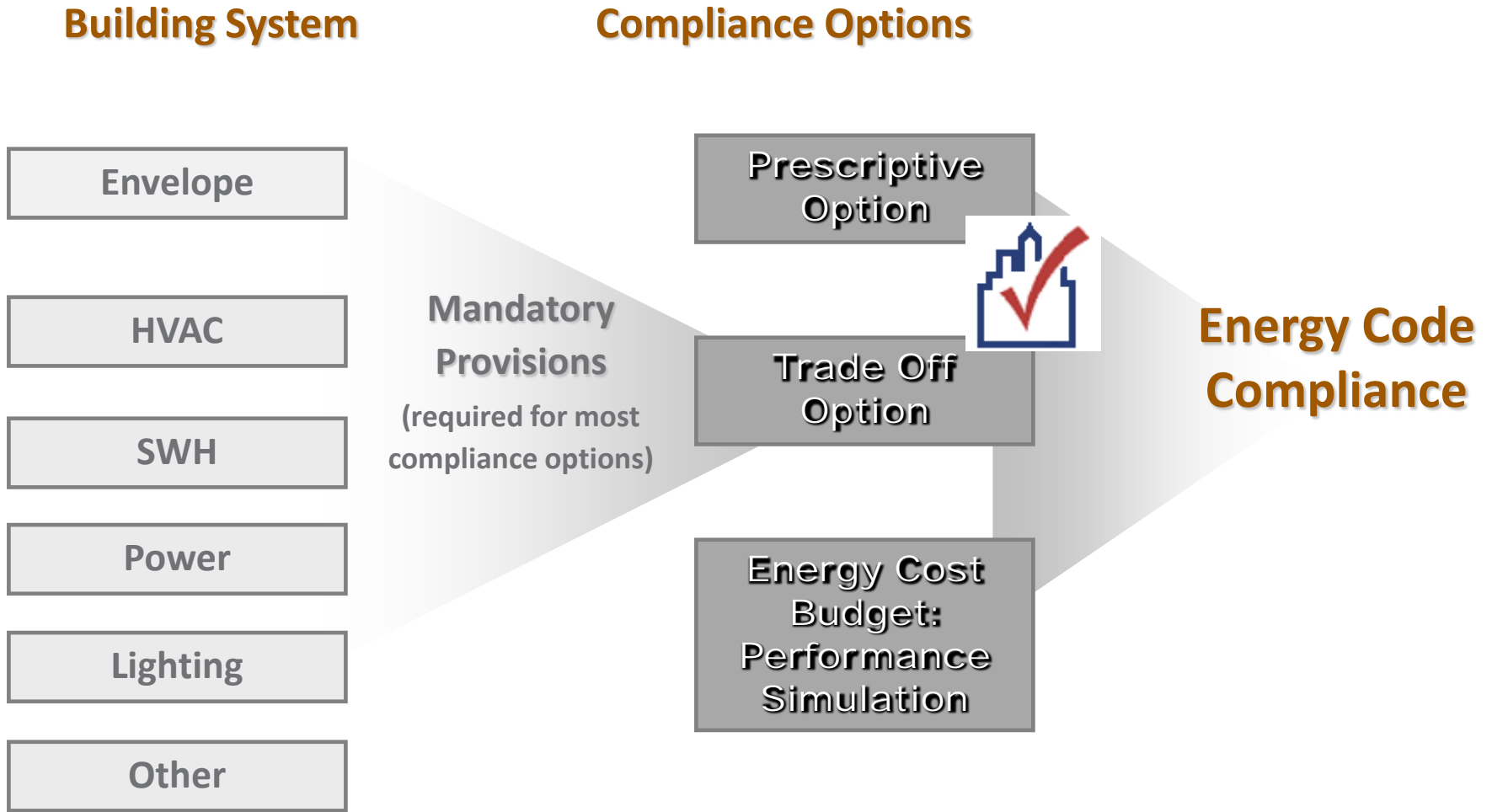
1. Obtain an overview of the basic functions and how *COMcheck* calculates compliance for the building envelope, interior and exterior lighting.
2. Be able to identify the construction specifications needed to complete a compliance calculation in the software.
3. Learn how to enter the building envelope, lighting, and mechanical components into the software.
4. Understand how the compliance reports are created and what they entail.

# CheckTools Current Use Scenario





BECP Tools used only during “Demonstrate Compliance” Stage

# COMcheck Compliance Methods

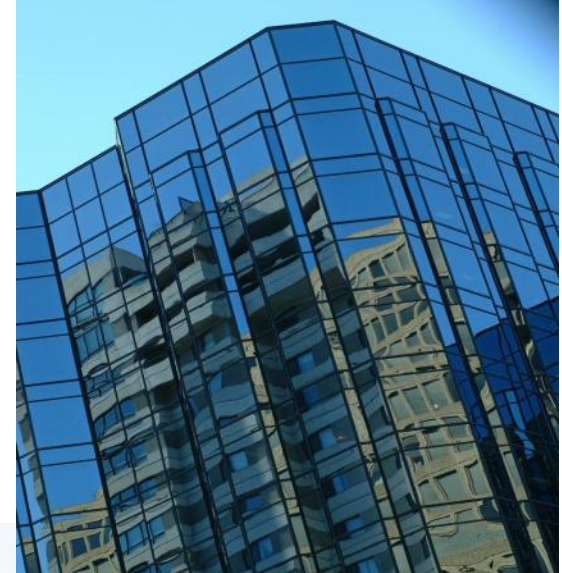


# Envelope Trade-Off Methods (cont.)

- ▶ ASHRAE 90.1 (Pre-2013) Normative Appendix C Methodology for Building Envelope Trade-Off Option
  - 90.1-2007/2010
  - 2009/2012 IECC
  
- ▶ ASHRAE 90.1-2013 Appendix C has limited performance method (EnergyPlus) 
  
- ▶ 2015 IECC Component Performance Alternative (Total UA) 

# Project Types

- ▶ New Construction:
  - Trade-off compliance method
  - Prescriptive – Oregon only
- ▶ Addition
  - Trade-off compliance method
  - Prescriptive – Oregon only
- ▶ Alteration
  - Prescriptive compliance



# Lighting Compliance Methods

- ▶ Mandatory requirements: Controls, Switching
- ▶ Interior/Exterior lighting power requirements
  - Complies if total connected power  $\leq$  lighting power allowance



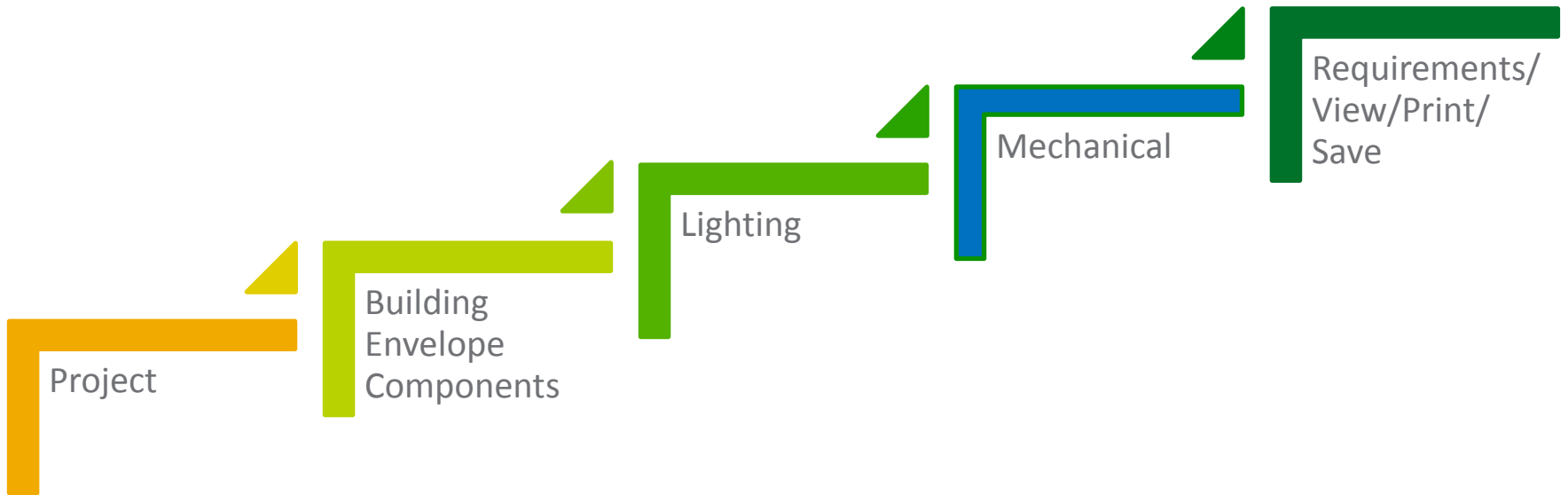


# Mechanical/Service Hot Water Compliance

- ▶ Efficiency requirements
- ▶ Economizer requirements
- ▶ Fan Power Limitation
- ▶ Mandatory requirements
- ▶ No compliance metric available



# COMcheck Project Specification Steps



# Info You'll Need

- ▶ Energy Code
- ▶ Builder and project location
- ▶ Area take-offs for envelope assemblies
- ▶ Insulation R-values, fenestration performance data
- ▶ Lighting fixture details
- ▶ Heating and cooling system details
- ▶ Service water heating details

U.S. DEPARTMENT OF **ENERGY** | Energy Efficiency & Renewable Energy

EERE Home | Programs & Offices | Consumer Information

## Building Energy Codes Program

Building Energy Codes

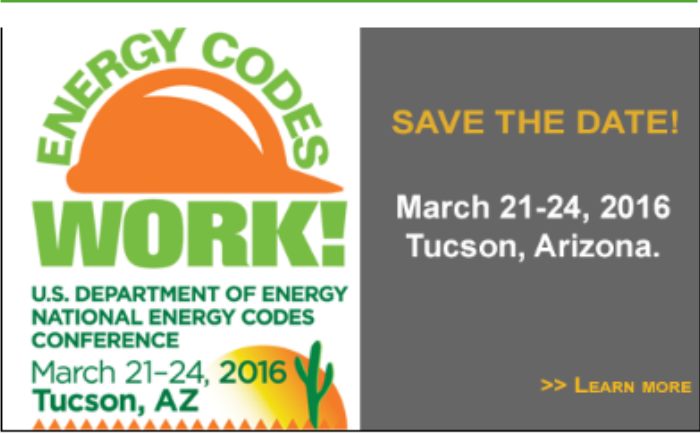
Search Help >

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U.S. Department of Energy » Energy Efficiency and Renewable Energy » Building Technologies Office » BECP Home

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ADOPTION  
COMPLIANCE  
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RESOURCE CENTER



**SAVE THE DATE!**  
March 21-24, 2016  
Tucson, Arizona.

>> LEARN MORE

HIGHLIGHTS

- [DOE Proposals for the 2018 IECC](#)
- [Energy and Energy Cost Savings Analysis of the 2015 IECC for Commercial Buildings](#)
- [Achieving Energy Savings and Emission Reductions from Building Energy Codes: A Primer for State Planning](#)
- [Residential Energy Code Field Study](#)
- [Training Materials for the 2015 IECC and Standard 90.1-2013](#)

### Popular Links

Tools ▼

- [COMcheck](#)
- [REScheck](#)

Technical Assistance ▼

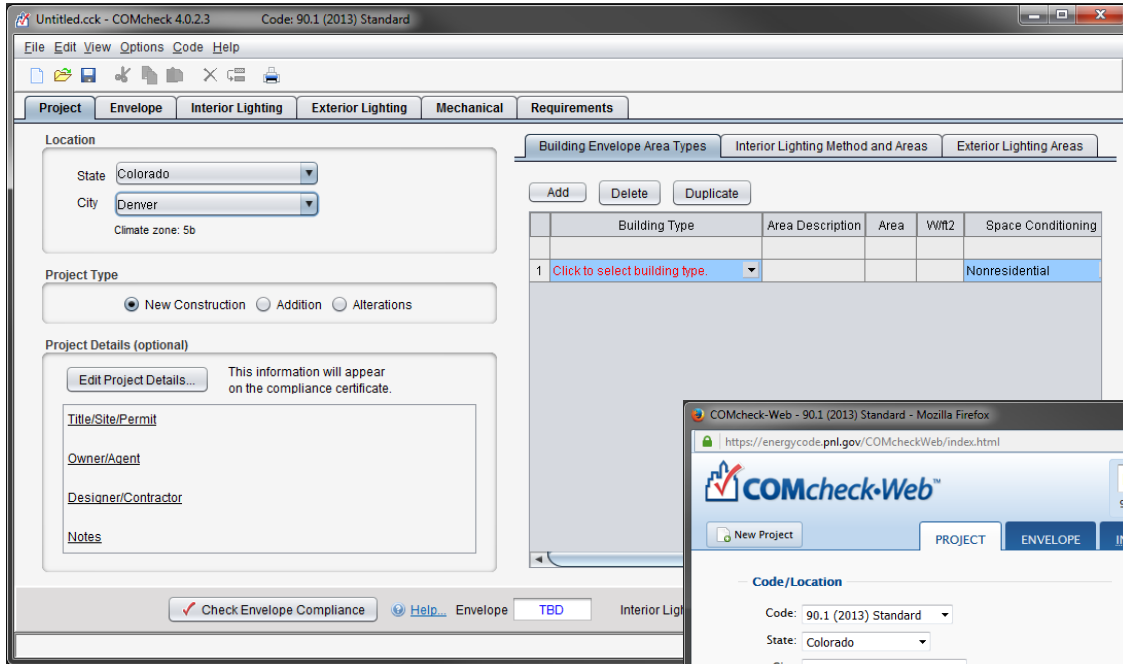
- [Help Desk](#)

Status of State Energy Codes ▼

Select a state ▼

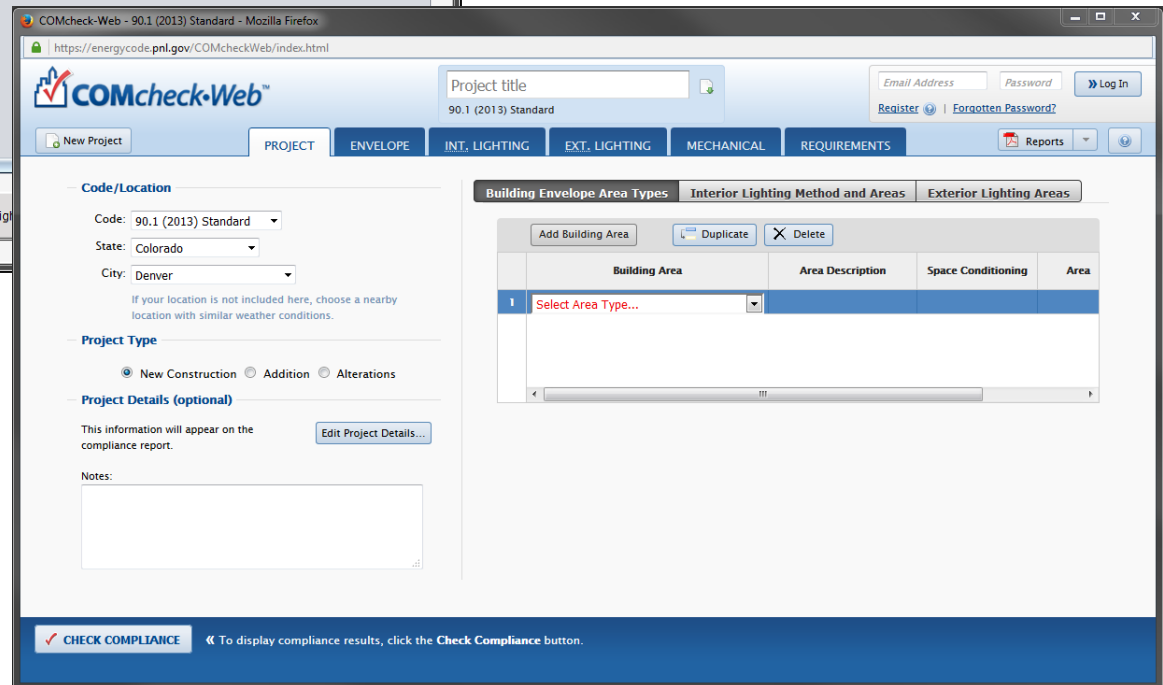
News ▼

- [ACEEE State Scorecard: Massachusetts Edges Out California as Most Energy-Efficient State, Maryland Among Most Improved](#)  
Source: ACEEE, posted: 10.21.2015
- [DOE Announces Winners of 2015 Federal Energy and Water Management Awards](#)  
Source: FEMP, posted: 10.19.2015
- [The many ways energy efficiency can boost your community's resilience](#)  
Source: ACEEE, posted: 10.05.2015
- [Missouri City Proposes Tiny-House-Friendly Building Codes](#)  
Source: Builder Online, posted: 10.02.2015
- [Pacific Northwest Residential Ventilation Effectiveness Study](#)



# “DESKTOP”

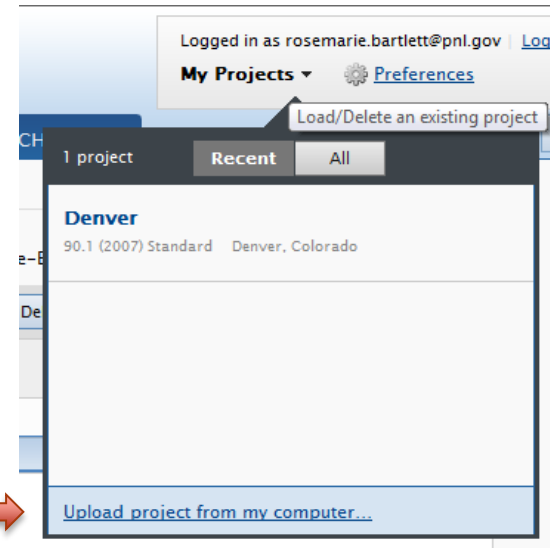
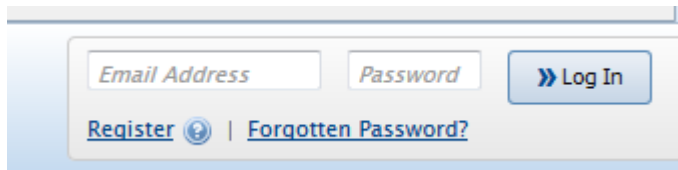
# WEB



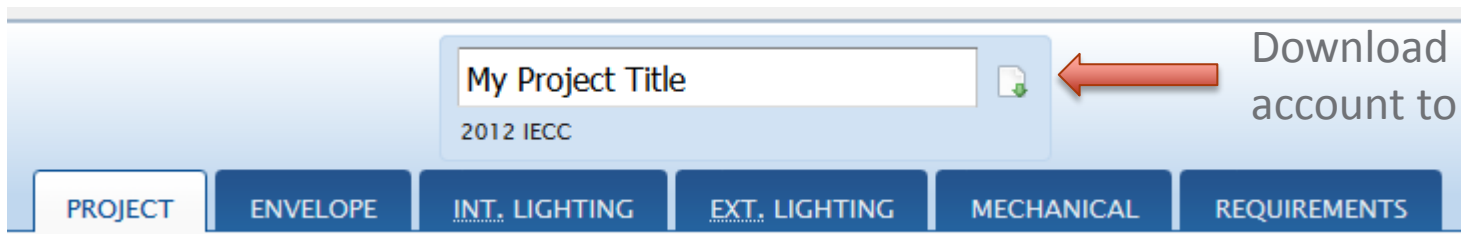
# Desktop/Web Data Exchange

► Can exchange files between desktop and web

- Log in to web
- My Projects



Upload from desktop to web account 



Download from web account to desktop

# COMcheck Basics: Color cues and feedback

Red

7	Window 3 in wall 3	Metal Frame:Fixed			Product ID: AX321 ...	500	ft2			0.420	0.40	
8	Exterior Wall 4	Wood-Framed, 24" o. c.	1 - Law library ...	South		1500	ft2	19.0	5.0	0.047		
9	Window 4 in wall 4	Metal Frame:Fixed			Product ID: AX321 ...	500	ft2			0.420	0.40	
10	Exterior Wall 5	Wood-Framed, 24" o. c.	1 - Law library ...	North		0			0.0	0.298		
11	Slab floor	Slab-On-Grade:Insul	1 - Law library ...		Insulation	400	ft		20.0			

Blue

Check Envelope Compliance   
 [Help...](#)   
 Envelope **TBD**   
 Lighting **+21%**   
 Exterior Lighting **+15%**

Green

Envelope **+0.9%**   
 Interior Lighting **+21%**   
 Exterior Lighting **+15%**

PassesZone6WoodFrameAtCode.cck - COMcheck 4.0.2.3    Code: 2015 IECC

File Edit View Options Code Help

Project Envelope Interior Lighting Exterior Lighting Mechanical Requirements

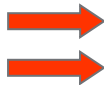
Add Fixture Fixture Library

	Component	Fixture ID	Fixture Description	Lamp Description/ Wattage Per Lamp	Ballast	Lamps Per Fixture	Number of Fixtures	Fixture Wattage	Track Lighting Wattage
	▼ Building	Allowed wattage = 10100    Proposed wattage = 8000							
1	▼ Law library ( Court Hou	Allowed wattage = 10100    Proposed wattage = 8000							
2	LED 1 copy 1			LED Linear 15W		1	200	16	
3	LED 1			LED Linear 15W		1	300	16	

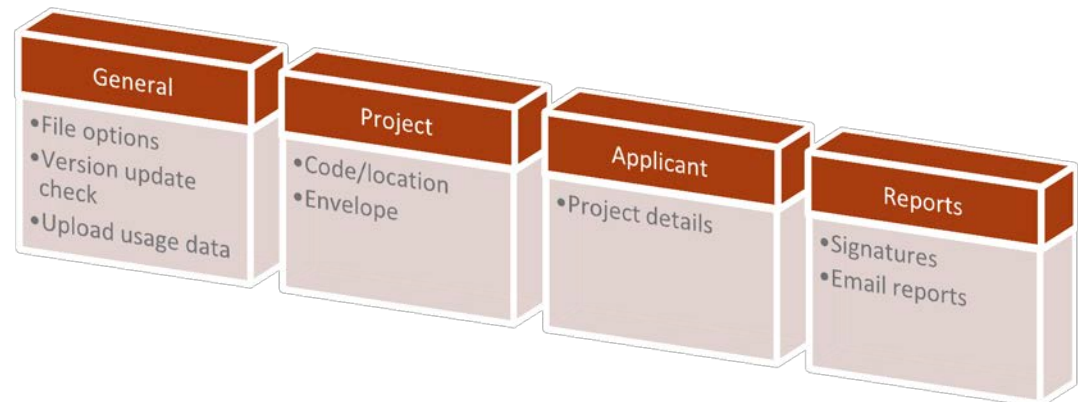
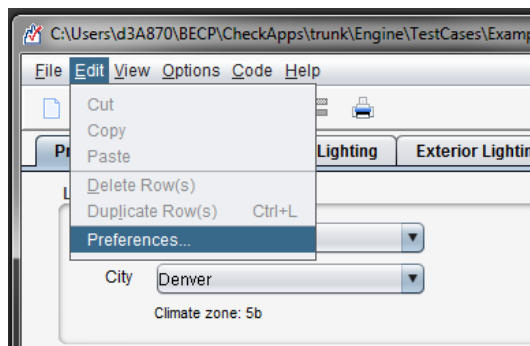
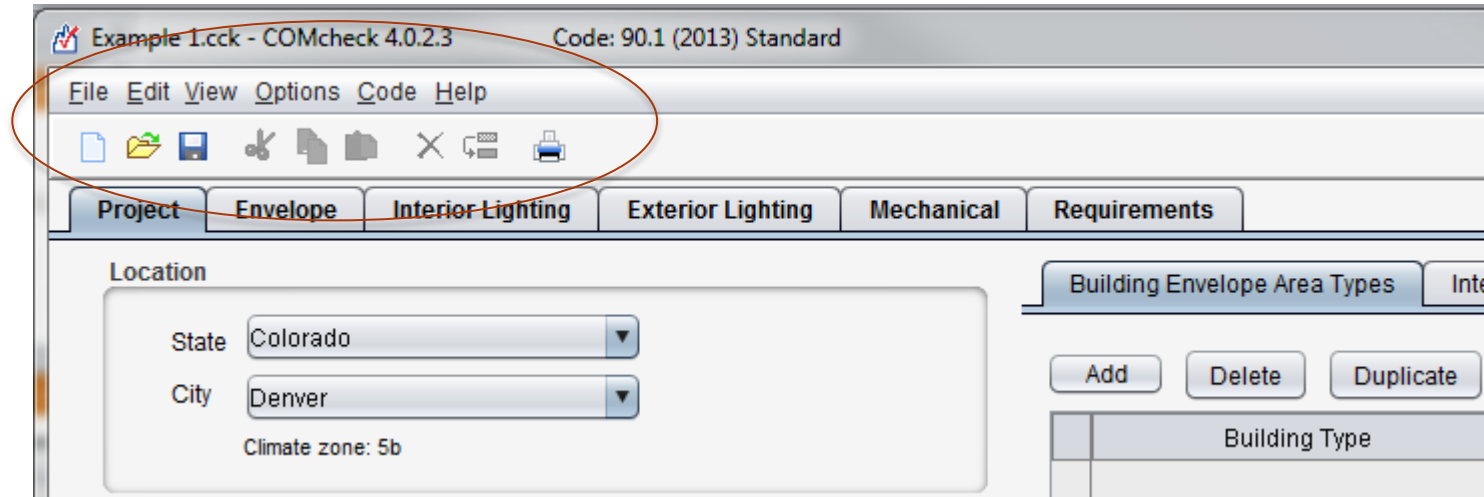
Envelope **+0.9%**    Interior Lighting **+21%**    Exterior Lighting **+15%**

Interior Lighting Passes: Design 21% better than Code

Compliance bar  
Status bar



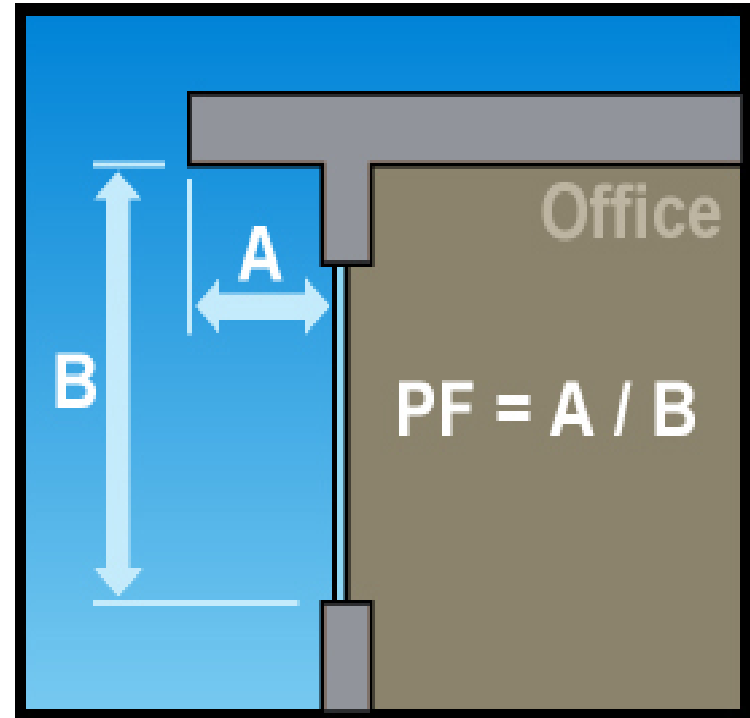
# COMcheck Basics: Menus and Toolbars





# COMcheck Basics: Options Menu

- ▶ Comments
- ▶ Orientation (code dependent)
  - Projection Factor
- ▶ Visible Transmittance
- ▶ Exemptions/Allowances



Projection Factor

# Project Screen

Untitled.cck - COMcheck 4.0.2.3 Code: 2015 IECC

File Edit View Options Code Help

Project Envelope Interior Lighting Exterior Lighting Mechanical Requirements

Location

State Colorado  
City Boulder  
Climate zone: 5b

Project Type

New Construction  Addition  Alterations

Compliance Options

Efficiency Options Unspecified [Help...](#)  
Air Barrier Options Unspecified [Help...](#)

Project Details (optional)

[Edit Project Details...](#) This information will appear on the compliance certificate.  
Title/Site/Permit

Building Envelope Area Types Interior Lighting Method and Areas Exterior Lighting Areas

Add Delete Duplicate

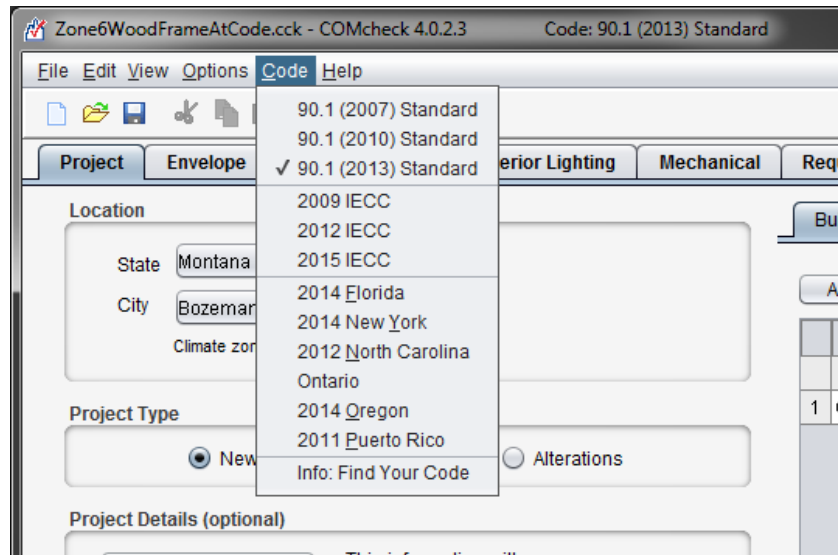
	Building Type	Area Description	Area	Wft2	Space Conditioning
1	<a href="#">Click to select building type.</a>				Nonresidential

Envelope TBD Interior Lighting TBD Exterior Lighting TBD

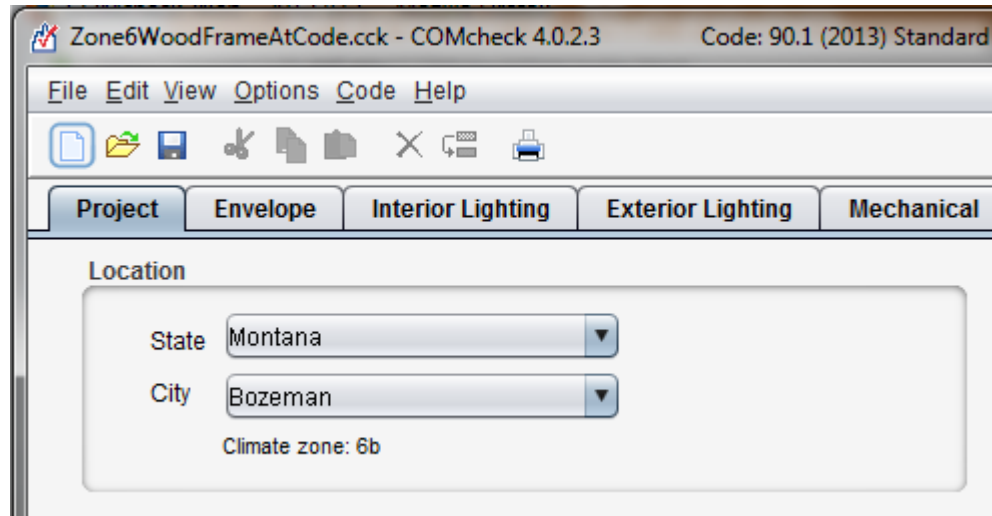
Efficiency Option must be specified (see Project screen)

# Project: Code and Location

▶ Appropriate Code



▶ Location



# Project: Project Type

- ▶ New Construction
- ▶ Addition
- ▶ Alteration

Project Type

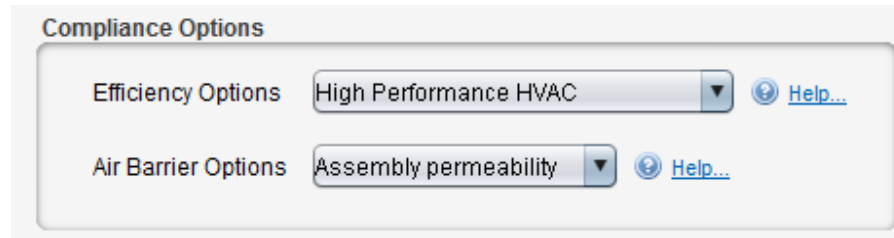
New Construction  Addition  Alterations



# Project: Alteration project type explained

- ▶ Projects involve changes to or replacement of
  - Existing building components that are part of building envelope
  - Lighting, heating, ventilating, air conditioning, and water-heating equipment
  
- ▶ Specify only those envelope components, lighting fixtures, or mechanical systems/equipment that will exist upon completion of the project
  
- ▶ Alteration detail dialogs
  - Specify exemptions if applicable
  - Additional qualifications may be required (e.g., Window/wall ratio)
  
- ▶ Compliance shown as Pass/Fail for Envelope and Lighting

# Compliance Options (IECC only)



The screenshot shows a web interface titled "Compliance Options". It contains two rows of controls. The first row is labeled "Efficiency Options" and has a dropdown menu set to "High Performance HVAC" with a "Help..." link to its right. The second row is labeled "Air Barrier Options" and has a dropdown menu set to "Assembly permeability" with a "Help..." link to its right.

## ► Efficiency Options

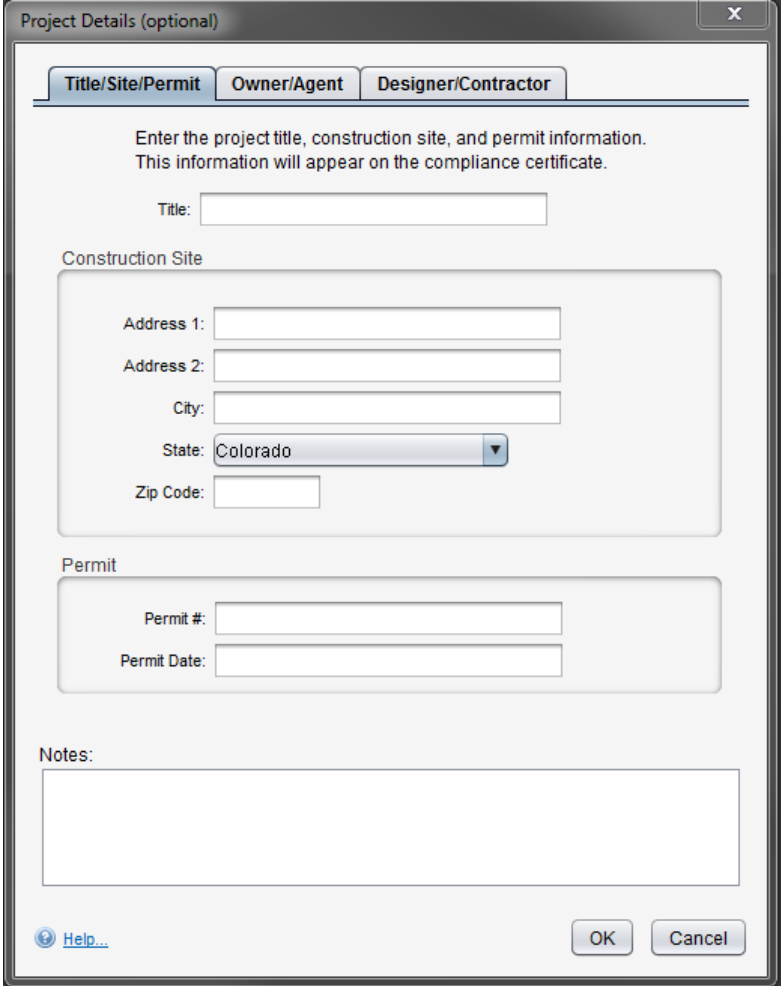
- High performance power (2012/2015)
- Reduced lighting power (2012/2015)
- On-site renewable energy (2012/2015)
- High performance SWH (2015)
- Enhanced interior lighting controls (2015)
- Dedicated outdoor air system (2015)

## ► Air Barrier Options (IECC 2012+, climate zone dependent)

- Air barrier permeability
- Assembly permeability
- Air leakage test

# Project: Project Details

- ▶ Optional
- ▶ Sections
  - Title/Site/Permit
  - Owner/Agent
  - Designer/Contractor
- ▶ Included on report



Project Details (optional)

**Title/Site/Permit** | Owner/Agent | Designer/Contractor

Enter the project title, construction site, and permit information. This information will appear on the compliance certificate.

Title:

Construction Site

Address 1:

Address 2:

City:

State: Colorado

Zip Code:

Permit

Permit #:

Permit Date:

Notes:

[Help...](#)



# Project: Building Envelope Area Types

- ▶ Primarily impacts envelope compliance
- ▶ Whole building types that describe the envelope (separating conditioned and unconditioned spaces)
- ▶ Space conditioning type
  - Nonresidential
  - Residential
  - Semiheated (no mechanical cooling) – 90.1 only



Building Envelope Area Types						Interior Lighting Method and Areas						Exterior Lighting Areas					
Add						Delete						Duplicate					
	Building Type		Area Description	Area	W/ft2	Space Conditioning											
1	Office	▼	Main law office	10000	0.82	Nonresidential ▼											
2	Library	▼	Law library	5000	1.19	Nonresidential ▼											
3	Parking Garage	▼	Garage	2000	0.21	Semiheated ▼											

# Project: Interior Lighting Method and Area Types

- ▶ Method determines lighting power density and allowances
- ▶ Area category allows for more detailed space representation

Building Envelope Area Types   Interior Lighting Method and Areas   Exterior Lighting Areas

Building Area Method (apply building envelope area types to interior lighting)  
 Area Category (Space-By-Space) Method

Add   Delete   Duplicate

	Area Category	Area Description	Area	Ceiling Height (ft)	W/ft2
1	Common Space Types:Office - Enclosed ▼	Law Office	8000	NA	1.11
2	Common Space Types:Office - Open Plan ▼	Law Office	2000	NA	0.98
3	Library:Reading Area ▼	Library	5000	NA	1.06
4	Parking Garage:Garage Area ▼	Garage	2000	NA	0.19

# Interior Lighting: Methods

- ▶ Selected method determines lighting power densities in interior lighting and exterior lighting screens
  - based on code, method, and applications selected on the Project screen

Building Envelope Area Types Interior Lighting Method and Areas Exterior Lighting Areas

Add Delete Duplicate

	Building Type	Area Description	Area	W/ft2	Space Conditioning
1	Office	Main law office	10000	0.82	Nonresidential
2	Library	Law library	5000	1.19	Nonresidential
3	Parking Garage	Garage	2000	0.21	Semiheated

Building Envelope Area Types Interior Lighting Method and Areas Exterior Lighting Areas

Building Area Method (apply building envelope area types to interior lighting)  
 Area Category (Space-By-Space) Method

Add Delete Duplicate

	Area Category	Area Description	Area	Ceiling Height (ft)	W/ft2
1	Common Space Types:Office - Enclosed	Law Office	8000	NA	1.11
2	Common Space Types:Office - Open Plan	Law Office	2000	NA	0.98
3	Library:Reading Area	Library	5000	NA	1.06
4	Parking Garage:Garage Area	Garage	2000	NA	0.19

# Project: Exterior Lighting Area Types

Exterior Lighting Zone: High activity metropolitan commercial dis...

Exterior Lig	Units
1	ft2

High activity metropolitan commercial dis...

Residentially zoned area

Residential mixed use area

Neighborhood business district

High activity metropolitan commercial district

Light industrial area with limited nighttime use

Developed area in national or state park

Developed area on forest land

Developed rural area

Other

- Zone and area type determine:
- Lighting power density
  - Units
  - Tradability

Exterior Lighting Zone: High activity metropolitan commercial dis...

	Exterior Lighting Area	Area Description	Quantity	Units	W/Unit	Tradable
1	Main entry	Front entry	15	ft of door width	30	Yes
2	Illuminated area of facade wall or surface	North facade	2000	ft2	0.2	No

# Exterior Lighting: Tradable Applications

- ▶ Tradable areas allow 'unused' allowable power to be traded between other tradable area (e.g., driveways and entry ways)
- ▶ Generally based on length or area of application then summed

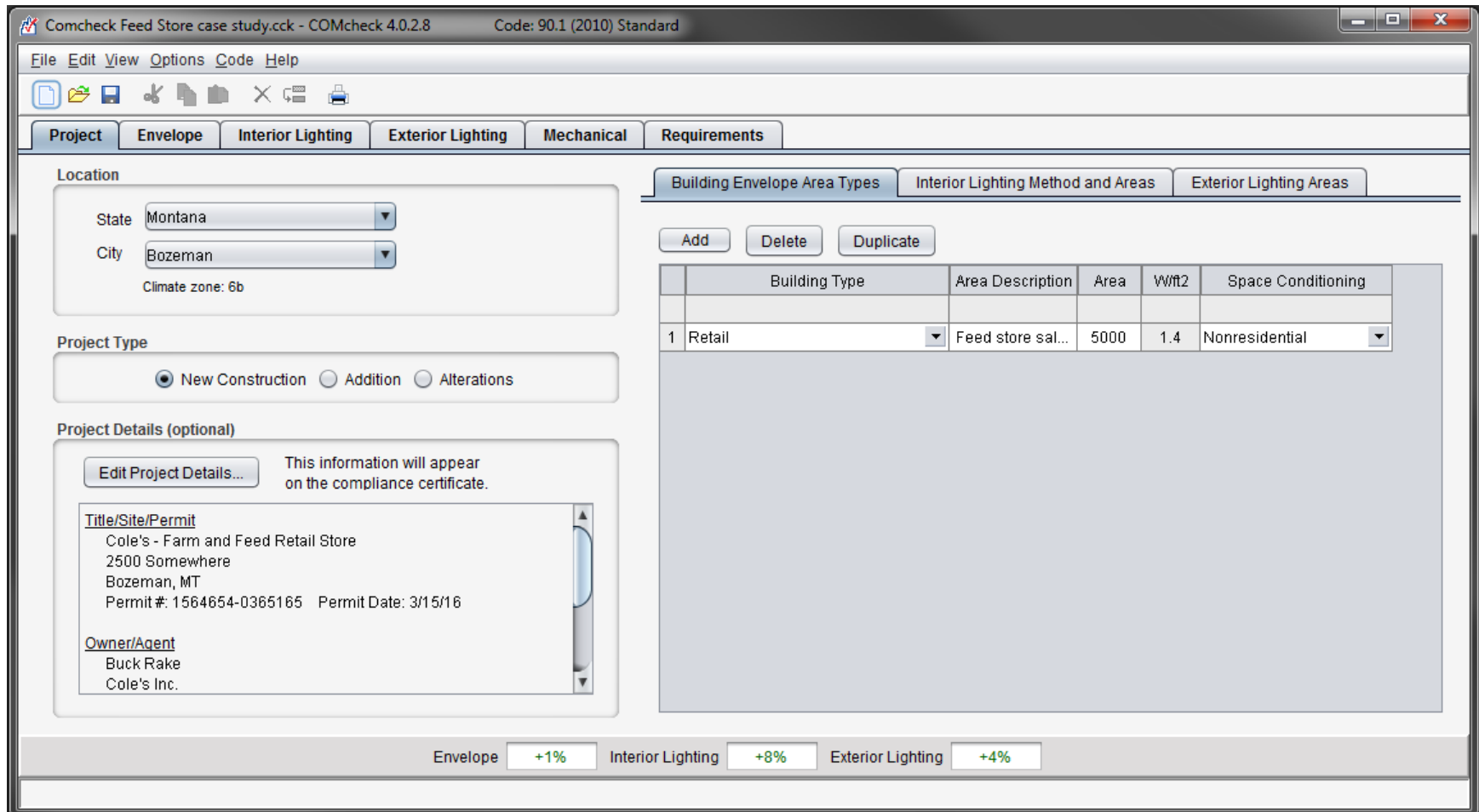


# Exterior Lighting: Non-Tradable Applications

- ▶ Non-tradable areas/applications are “use it or lose it” (e.g., building façade lighting, ATM stations)



# Project Summary and example



Comcheck Feed Store case study.cck - COMcheck 4.0.2.8 Code: 90.1 (2010) Standard

File Edit View Options Code Help

Project Envelope Interior Lighting Exterior Lighting Mechanical Requirements

**Location**

State: Montana  
City: Bozeman  
Climate zone: 6b

**Project Type**

New Construction  Addition  Alterations

**Project Details (optional)**

Edit Project Details... This information will appear on the compliance certificate.

Title/Site/Permit  
Cole's - Farm and Feed Retail Store  
2500 Somewhere  
Bozeman, MT  
Permit #: 1564654-0365165 Permit Date: 3/15/16

Owner/Agent  
Buck Rake  
Cole's Inc.

**Building Envelope Area Types** Interior Lighting Method and Areas Exterior Lighting Areas

Add Delete Duplicate

	Building Type	Area Description	Area	Wft2	Space Conditioning
1	Retail	Feed store sal...	5000	1.4	Nonresidential

Envelope +1% Interior Lighting +8% Exterior Lighting +4%



# Envelope: Introduction

Untitled.cck - COMcheck 4.0.2.8 Code: 90.1 (2013) Standard

File Edit View Options Code Help

Project Envelope Interior Lighting Exterior Lighting Mechanical Requirements

Roof Skylight Exterior Wall Semi-Exterior Wall Window Door Basement Floor

Component	Assembly	Building Area Type	Orientation	Fenestration Details	Construction Details	Gross Area	Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor	SHGC	Projection Factor	VT
Building												

Use the building assembly buttons above the column headers to create a description of your building.

✓ Check Envelope Compliance Help... Envelope TBD Interior Lighting TBD Exterior Lighting TBD

Invalid building envelope area type (see project screen)

- ▶ Cavity Insulation R-value – insulation placed between structural members
- ▶ Continuous Insulation R-value – ‘continuous’ insulation across the structure (e.g., rigid insulation)
- ▶ After you’ve entered building components, look at compliance result
  - Look for fields with red text
  - If TBD, look for missing data



# Envelope: Opaque Assemblies

Comcheck Feed Store case study.cck - COMcheck 4.0.2.8 Code: 90.1 (2010) Standard

File Edit View Options Code Help

Project Envelope Interior Lighting Exterior Lighting Mechanical Requirements

Roof Skylight Exterior Wall Semi-Exterior Wall Window Door Basement Floor

Component	Assembly	Building Area Type	Orientation	Fenestration Details	Construction Details	Gross Area	Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor		
▼ Building											
1	Roof 1	Metal Building, Standing Seam		1 - Feed store sales area (Retail Nonreside...		Double In...	5000	ft2	30.0	0.0	0.051
2	West Exterior Wall bottom section	Steel-Framed, 16" o.c.	West	1 - Feed store sales area (Retail Nonreside...			500	ft2	15.0	15.0	0.043
3	West Exterior Wall top section	Metal Building Wall	West	1 - Feed store sales area (Retail Nonreside...		Single La...	175	ft2	15.0	0.0	0.100
4	East Exterior Wall bottom section	Steel-Framed, 16" o.c.	East	1 - Feed store sales area (Retail Nonreside...			500	ft2	15.0	15.0	0.043
5	Vehicle bay door	Other Door				Non-Swin...	100	ft2			0.700
6	Man-door	Insulated Metal				Swinging	21	ft2			0.520
7	East Exterior Wall top section	Metal Building Wall	East	1 - Feed store sales area (Retail Nonreside...		Single La...	175	ft2	15.0	0.0	0.100
8	South exterior wall bottom section	Steel-Framed, 16" o.c.	South	1 - Feed store sales area (Retail Nonreside...			1000	ft2	15.0	15.0	0.043
9	South wall 5' x 5' windows	Metal Frame, Double Pane wit...			Product ID:...		108	ft2			0.320
10	Main entry side-by-side door	Glass			Product ID:...		42	ft2			0.450
11	South exterior wall top section	Metal Building Wall	South	1 - Feed store sales area (Retail Nonreside...		Single La...	500	ft2	15.0	0.0	0.100
12	North exterior wall bottom section	Steel-Framed, 16" o.c.	North	1 - Feed store sales area (Retail Nonreside...			1000	ft2	15.0	15.0	0.043
13	Man-door	Insulated Metal				Swinging	21	ft2			0.520
14	North Exterior Wall top section	Metal Building Wall	North	1 - Feed store sales area (Retail Nonreside...		Single La...	200	ft2	15.0	0.0	0.100
15	Floor 1	Slab-On-Grade:Unheated		1 - Feed store sales area (Retail Nonreside...		Insulation...	300	ft		10.0	

Envelope +2% Interior Lighting +44% Exterior Lighting +18%

- ▶ Cavity Insulation R-value – insulation placed between structural members
- ▶ Continuous Insulation R-value – ‘continuous’ insulation across the structure (e.g., rigid insulation)



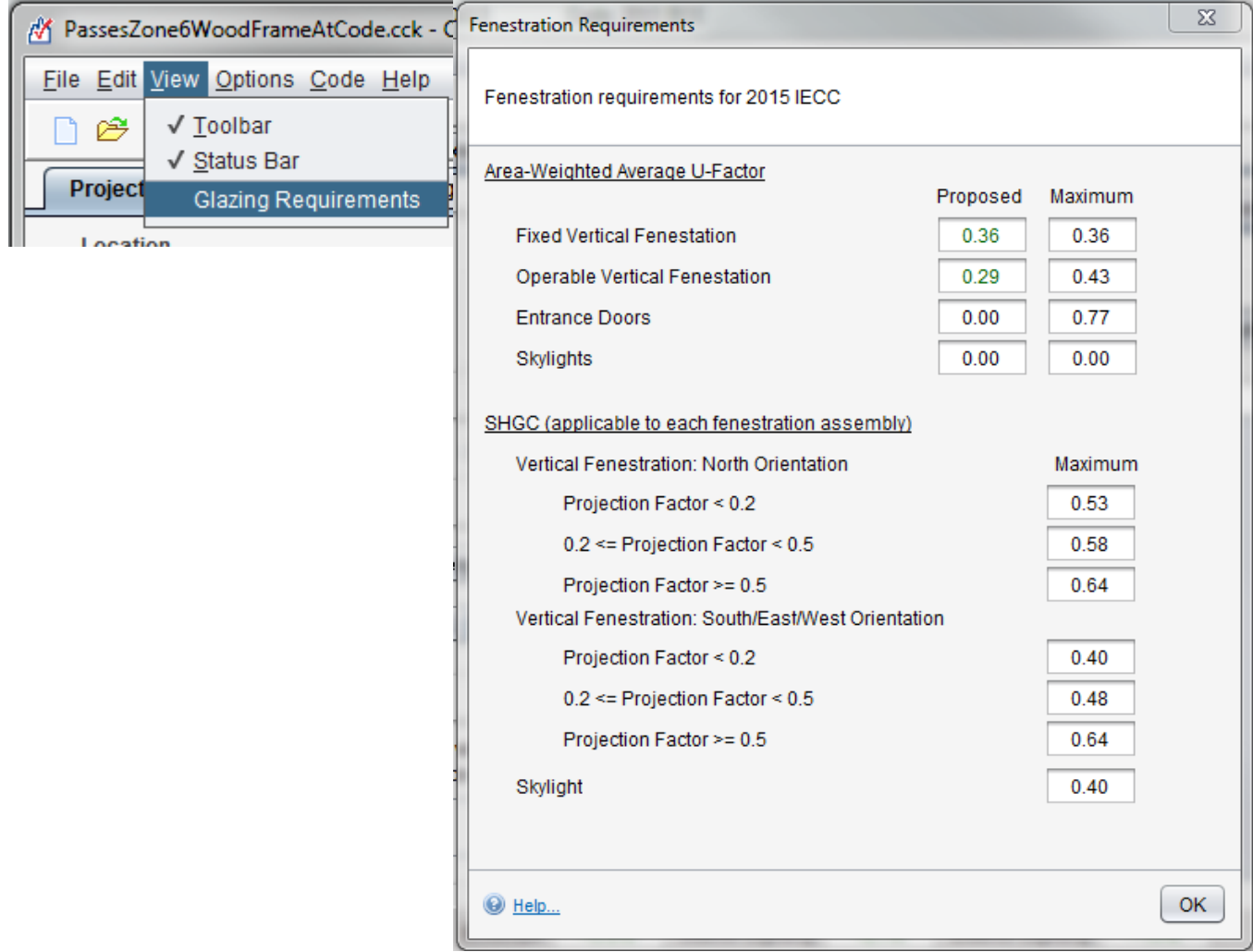
# Envelope: Fenestration

- ▶ NFRC site-built certified product
- ▶ Performance evaluated (per NFRC guidelines)
- ▶ Energy code defaults

The screenshot shows the COMcheck software interface. The main window displays a table of building components. The 'Window 1' component is selected, and a 'Fenestration Performance Details' dialog box is open over it. The dialog box has two radio button options: 'NFRC site-built certified product (commercial products only)' and 'Product performance evaluated in accordance with NFRC'. The second option is selected. Below this, there are input fields for 'U-factor' (0.360), 'SHGC' (0.400), and 'VT' (0.440). A 'Product ID' field contains 'AX321'. At the bottom of the dialog are 'OK' and 'Cancel' buttons.

Component	Assembly	Building Area Type	Orientation	Fenestration Details	Cons De
▼ Building					
1	Roof	Insulation Entirely Abo...	1 - Law library ...		
2	▼ Exterior Wall 1	Wood-Framed, 24" o.c.	1 - Law library ...	North	
3	Window 1	Metal Frame:Fixed		Product ID: AX3...	
4	▼ Exterior Wall 2	Wood-Framed, 24" o.c.	1 - Law library ...	East	
5	Window 2 in Wall2	Metal Frame:Fixed		Product ID: AX321 ...	
6	▼ Exterior Wall 3	Wood-Framed, 24" o.c.	1 - Law library ...	West	
7	Window 3 in wall 3	Metal Frame:Fixed		Product ID: AX321 ...	
8	▼ Exterior Wall 4	Wood-Framed, 24" o.c.	1 - Law library ...	South	
9	Window 4 in wall 4	Metal Frame:Operable		Product ID: WWZ ...	
10	Slab floor	Slab-On-Grade:Unhea...	1 - Law library ...		Insulat

## ▶ Menu View->Glazing Requirements



The screenshot shows a software window titled "Fenestration Requirements" for the file "PassesZone6WoodFrameAtCode.cck". The "View" menu is open, showing options for "Toolbar", "Status Bar", and "Glazing Requirements". The dialog box displays the following requirements:

Fenestration requirements for 2015 IECC		
<u>Area-Weighted Average U-Factor</u>		
	Proposed	Maximum
Fixed Vertical Fenestration	0.36	0.36
Operable Vertical Fenestration	0.29	0.43
Entrance Doors	0.00	0.77
Skylights	0.00	0.00

<u>SHGC (applicable to each fenestration assembly)</u>	
Vertical Fenestration: North Orientation	
	Maximum
Projection Factor < 0.2	0.53
0.2 <= Projection Factor < 0.5	0.58
Projection Factor >= 0.5	0.64
Vertical Fenestration: South/East/West Orientation	
Projection Factor < 0.2	0.40
0.2 <= Projection Factor < 0.5	0.48
Projection Factor >= 0.5	0.64
Skylight	0.40



# Envelope: Summary

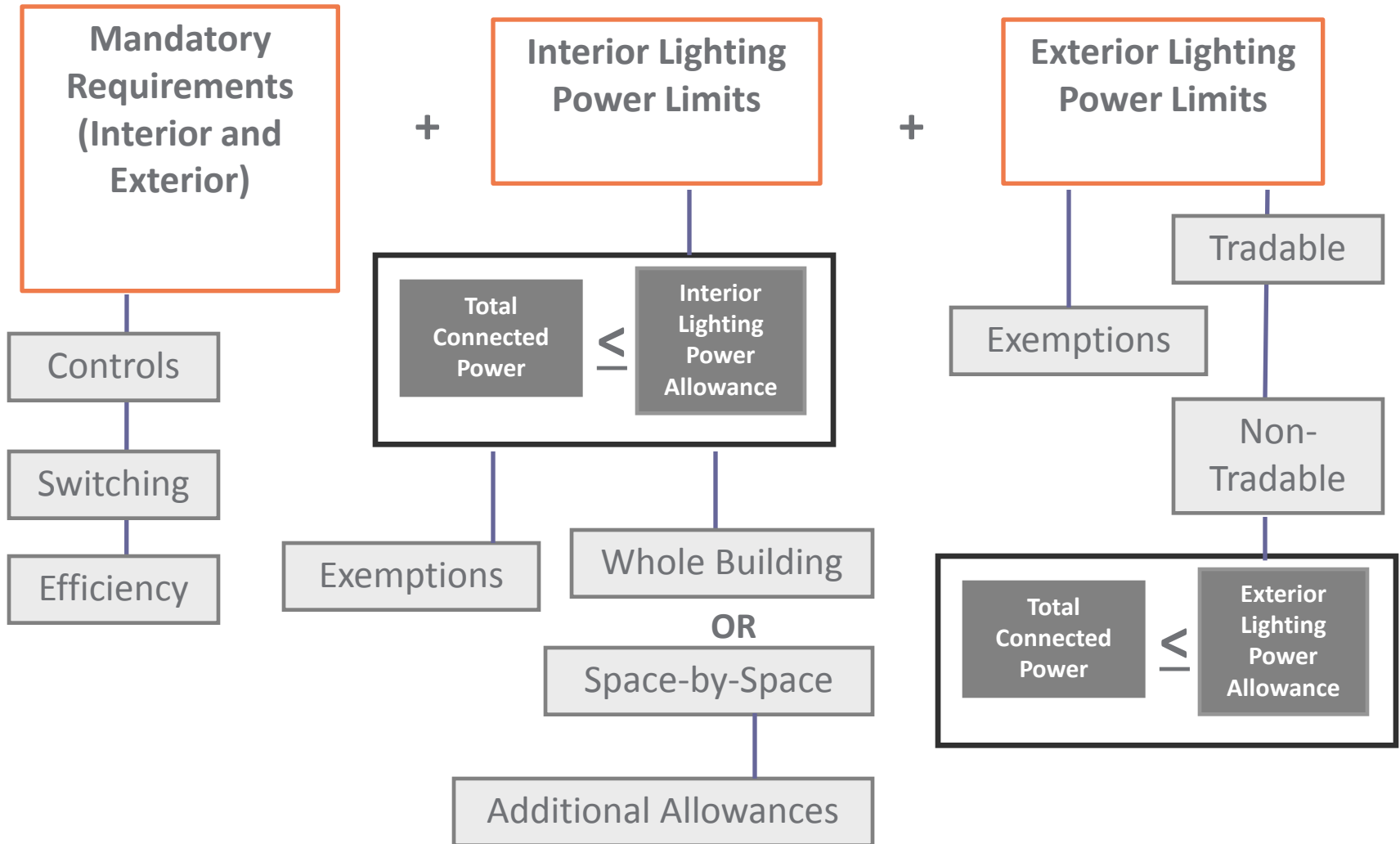
	Component	Assembly	Building Area Type	Orientation	Fenestration Details	Construction Details	Gross Area		Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor	SHGC	Projection Factor
▼ Building													
1	Roof	Insulation Entirely Abo...	1 - Law library ...				10000	ft2		30.0	0.032		
2	▼ Exterior Wall 1	Wood-Framed, 24" o.c.	1 - Law library ...	North			1000	ft2	13.0	7.5	0.050		
3	Window 1	Metal Frame:Fixed			Product ID: AX321 ...		300	ft2			0.360	0.40	0.00
4	▼ Exterior Wall 2	Wood-Framed, 24" o.c.	1 - Law library ...	East			1000	ft2	13.0	7.5	0.050		
5	Window 2 in Wall2	Metal Frame:Fixed			Product ID: AX321 ...		300	ft2			0.360	0.40	0.00
6	▼ Exterior Wall 3	Wood-Framed, 24" o.c.	1 - Law library ...	West			1000	ft2	13.0	7.5	0.050		
7	Window 3 in wall 3	Metal Frame:Fixed			Product ID: AX321 ...		300	ft2			0.360	0.40	0.00
8	▼ Exterior Wall 4	Wood-Framed, 24" o.c.	1 - Law library ...	South			1000	ft2	13.0	7.5	0.050		
9	Window 4 in wall 4	Metal Frame:Operable			Product ID: WWZ ...		300	ft2			0.290	0.40	0.00
10	Slab floor	Slab-On-Grade:Unhea...	1 - Law library ...			Insulation...	400	ft		10.0			

Check Envelope Compliance    Help...    Envelope    TBD    Interior Lighting    +21%    Exterior Lighting    +15%

- ▶ Don't have to use every assembly type
- ▶ Can group "like" components
- ▶ Gross area (except slab-on-grade)
- ▶ Use "Other" assembly as needed



# Lighting Compliance



# Interior Lighting: Spaces and Fixtures

Building Envelope Area Types | Interior Lighting Method and Areas | Exterior Lighting Areas

Building Area Method (apply building envelope area types to interior lighting)  
 Area Category (Space-By-Space) Method

	Area Category	Area Description	Area	Ceiling Height (ft)	W/ft2
1	Common Space Types:Office - Enclosed		168	NA	1.11
2	Retail:Sales Area		4760	NA	1.68
3	Common Space Types:Restrooms		72	NA	0.98

- ▶ Select space then *Add Fixture* button or *Fixture Library*
- ▶ Fixture library preserves frequently used fixtures for future use
- ▶ Allowed/Proposed wattage balance maintained

Comcheck Feed Store case study.cck - COMcheck 4.0.2.8 Code: 90.1 (2010) Standard

File Edit View Options Code Help

Project | Envelope | Interior Lighting | Exterior Lighting | Mechanical | Requirements

	Component	Fixture ID	Fixture Description	Lamp Description/ Wattage Per Lamp	Ballast	Lamps Per Fixture	Number of Fixtures	Fixture Wattage	Track Lighting Wattage
	▼ Building	Allowed wattage = 8254 Proposed wattage = 4642							
1	▼ Common Space Types:Office - Enclosed (168 sq.ft.)	Allowed wattage = 186 Proposed wattage = 698							
2	Incandescent 1	G	Recessed wall wa...	Incandescent 100W		1	2	100.0	
3	Incandescent 2	H	Desk lighting	Incandescent 50W		1	5	50.0	
4	Linear Fluorescent 8	X	Overhead	48" T8 32W	Electronic	4	2	124.0	
5	▼ Retail:Sales Area (4760 sq.ft.)	Allowed wattage = 7997 Proposed wattage = 3696							
6	Linear Fluorescent 7	F	2X4 pendent	96" T8 75W	Electronic	2	28	132.0	
7	▼ Common Space Types:Restrooms (72 sq.ft.)	Allowed wattage = 71 Proposed wattage = 248							
8	Linear Fluorescent 8 copy 1	Z	Vanity fixture	48" T8 32W	Electronic	4	2	124.0	

Envelope +2% Interior Lighting +44% Exterior Lighting +18%

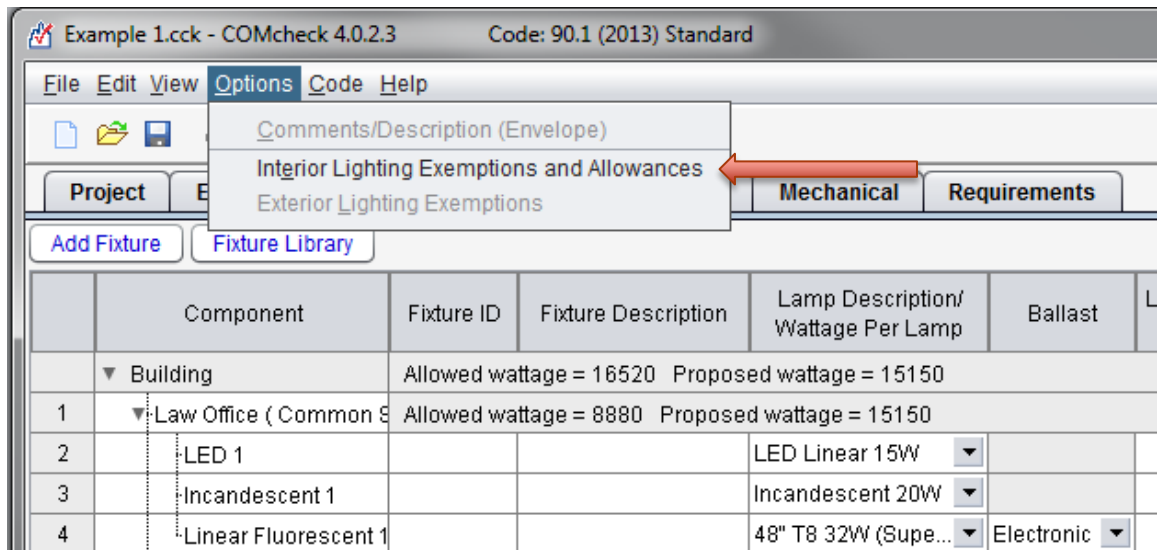


# Lighting Fixture Categories

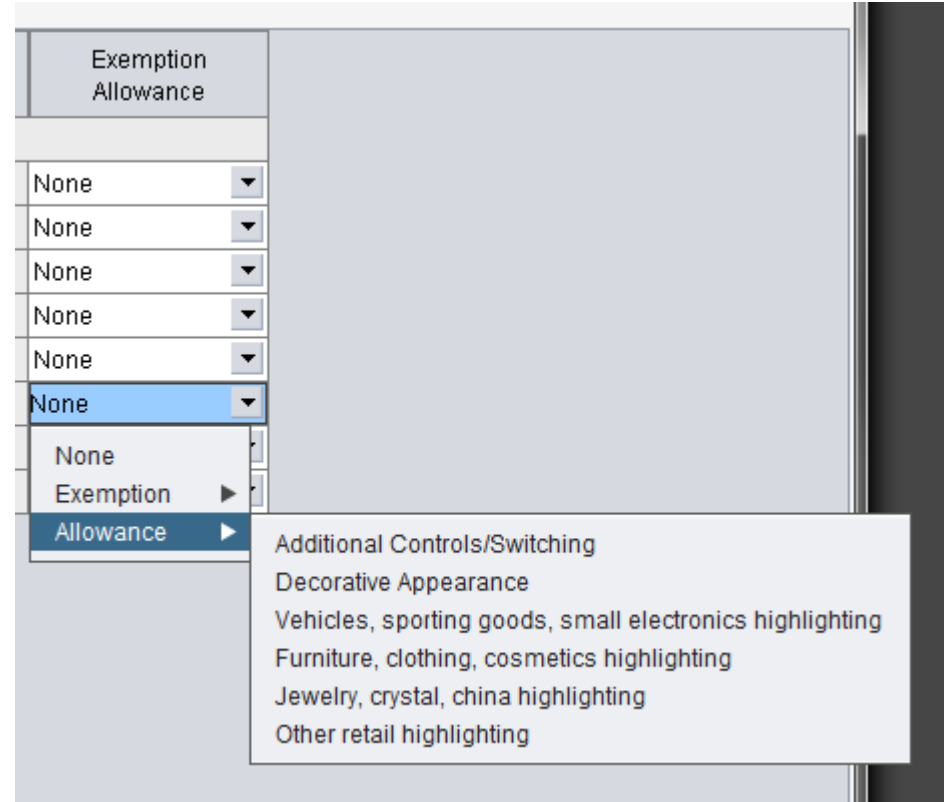
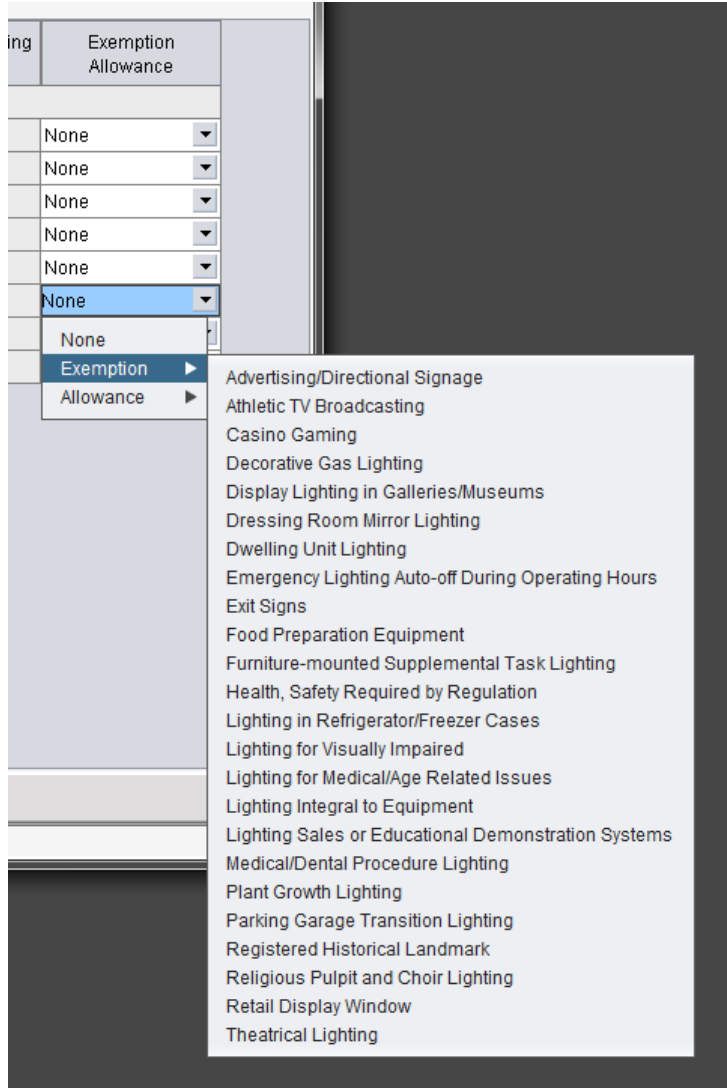
- ▶ Linear fluorescent
- ▶ Compact fluorescent
- ▶ HID
- ▶ Incandescent
- ▶ Halogen
- ▶ Track lighting
- ▶ LED
- ▶ Induction

# Lighting: Exemptions and Allowances

- ▶ Options menu
  - ▶ Exemptions
    - Power for exempt fixtures is omitted from the **proposed wattage**
  - ▶ Allowances
    - **Allowed wattage** for building increased by allowable amount



# Lighting: Exemptions and Allowances (cont)



# Exterior Lighting

- ▶ Inputs will be based on code selected
- ▶ Mandatory requirements
- ▶ Exemptions



# Exterior Lighting: Example

Building Envelope Area Types Interior Lighting Method and Areas Exterior Lighting Areas

Exterior Lighting Zone: Neighborhood business district

Add Delete Duplicate Help...

	Exterior Lighting Area	Area Description	Quantity	Units	W/Unit	Tradable
1	Illuminated area of facade wall ...		500	ft2	0.1	No
2	Entry canopy		500	ft2	0.25	Yes
3	Other door (not main entry)		3	ft of doo...	20	Yes
4	Other door (not main entry)		3	ft of doo...	20	Yes
5	Parking area		10000	ft2	0.06	Yes

- ▶ Lighting applications entered similar to interior lighting
- ▶ Pay attention to tradable versus non-tradable criteria.

Comcheck Feed Store case study.ck - COMcheck 4.0.2.8 Code: 90.1 (2010) Standard

File Edit View Options Code Help

Project Envelope Interior Lighting Exterior Lighting Mechanical Requirements

Add Fixture Fixture Library

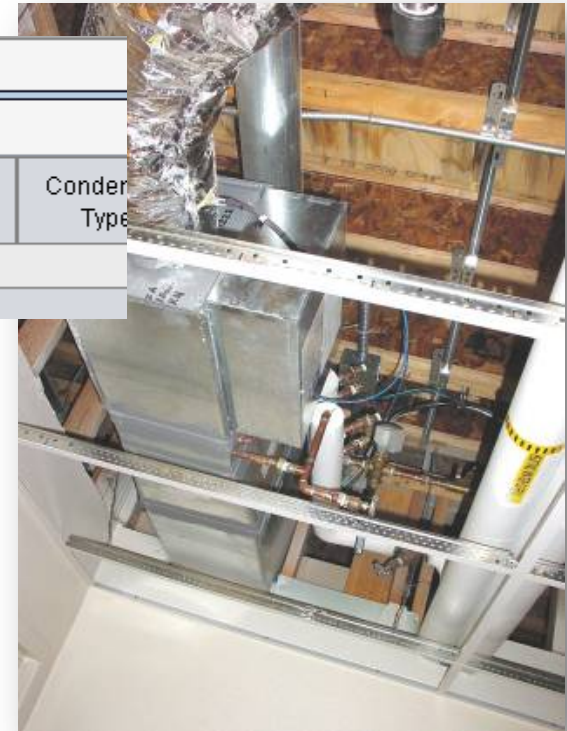
	Component	Fixture ID	Fixture Description	Lamp Description/ Wattage Per Lamp	Ballast	Lamps Per Fixture	Number of Fixtures	Fixture Wattage	Track Lighting Wattage	Exemption
▼ Exterior Lighting Areas:		Tradable Wattage: Allowed = 845 Proposed = 1086 Supplemental wattage: 600 (see Help for details)								
1	▼ Illuminated area of facade wall or surface (500 ft2)	Non-tradable Wattage: Allowed = 50 Proposed = 1640								
2	LED 2			LED Roadway-Pa...		1	20	82		None
3	▼ Entry canopy (500 ft2)	Tradable Wattage: Allowed = 125 Proposed = 16								
4	LED 1			LED Linear 20W		1	4	4		None
5	▼ Other door (not main entry) (3 ft of door width)	Tradable Wattage: Allowed = 60 Proposed = 35								
6	HID 2			High-Pressure So...	Standard	1	1	35.0		None
7	▼ Other door (not main entry) (3 ft of door width)	Tradable Wattage: Allowed = 60 Proposed = 35								
8	HID 2			High-Pressure So...	Standard	1	1	35.0		None
9	▼ Parking area (10000 ft2)	Tradable Wattage: Allowed = 600 Proposed = 1000								
10	HID 1			High-Pressure So...	Standard	1	10	100.0		None

Envelope +2% Interior Lighting +44% Exterior Lighting TBD

Fails: One or more non-tradable exterior lighting use areas fail

# Mechanical Systems

Project	Envelope	Interior Lighting	Exterior Lighting	Mechanical	Requirements	
HVAC System		Plant	Water Heating	Fan Systems		
Component	System Type	Quantity	Capacity	Cap. Units	Fuel Type/ Heat Source	Conden Type
Building						



- ▶ Limited means to determine compliance
- ▶ Enter characteristics of
  - HVAC system
  - Plant
  - Water heating
- ▶ Characteristics you select determine which requirements apply

# Mechanical Systems

HVAC System

HVAC Equipment Type:

Heating Equipment Type:

- None
- Central Furnace
- Duct Furnace
- Hydronic or Steam Coil
- Heat Pump
- Packaged Terminal Unit
- Radiant Heater
- Unit Heater
- Other

Cooling Equipment Type:

- None
- Field-Assembled DX System
- Hydronic Coil
- Packaged Terminal DX Unit
- Room Air Conditioner
- Room AC With Louvered Slides
- Single Package DX Unit
- Single Package Vertical AC Unit
- Split DX System
- VRF Zone Fan Unit
- Computer Room AC Unit
- Upflow Unit
- Other

Zoning Category:

- Single Zone
- Multiple Zone
- Perimeter System
- Perimeter System

▶ Example of a typical duct furnace and split system

Example 1.cck - COMcheck 4.0.2.3 Code: 90.1 (2013) Standard

File Edit View Options Code Help

Project Envelope Interior Lighting Exterior Lighting Mechanical Requirements

HVAC System Plant Water Heating Fan Systems

	Component	System Type	Quantity	Capacity	Cap. Units	Fuel Type/ Heat Source	Condenser Type	System Details	Fan System Details	Proposed Efficiency	Eff. Units	Minimum Efficiency
	▼ Building											
1	▼ HVAC System 1	HVAC System	1					Single zone system	Cooling fan system			
2	Heating equipment	Duct Furnace	1	200	kBtu/h	Electric				--	--	--
3	Cooling equipment	Split System	1	300	kBtu/h		Air-Cooled	Air Economizer		10.00	EER	10.00 EER



# Mechanical: Fan Systems

- ▶ Determines Fan Power Limitations compliance for each fan system
- ▶ Motor nameplate HP and brake HP
  - Brake HP includes pressure drop credits as applicable

**Fan Systems**

Fan systems are subject to fan power limitation requirements. Use this screen to define and determine compliance of each fan system in your building project. Include all supply fans, return/relief fans, exhaust fans, and fan-powered terminal units associated with each fan system providing heating or cooling capability. Fan systems defined in this screen will be available for assignment to a mechanical system in the mechanical tab. Select help for more details.

▼  Fan System ID:  Areas Served:

Fan System Compliance Options

Method:  Motor Nameplate HP  Brake HP  Flow control devices installed on exhaust/return to meet health, safety environmental air pressure requirements in hospital, vivarium or laboratory systems.

Fans

	Fan ID	Fan Type	Fan Control	Air Volume (CFM)	Motor Nameplate ...	Fan Efficiency
1	FAN 1	Supply	Single-Zone VAV	20000.0	20.0	90.0

Compliance: Passes

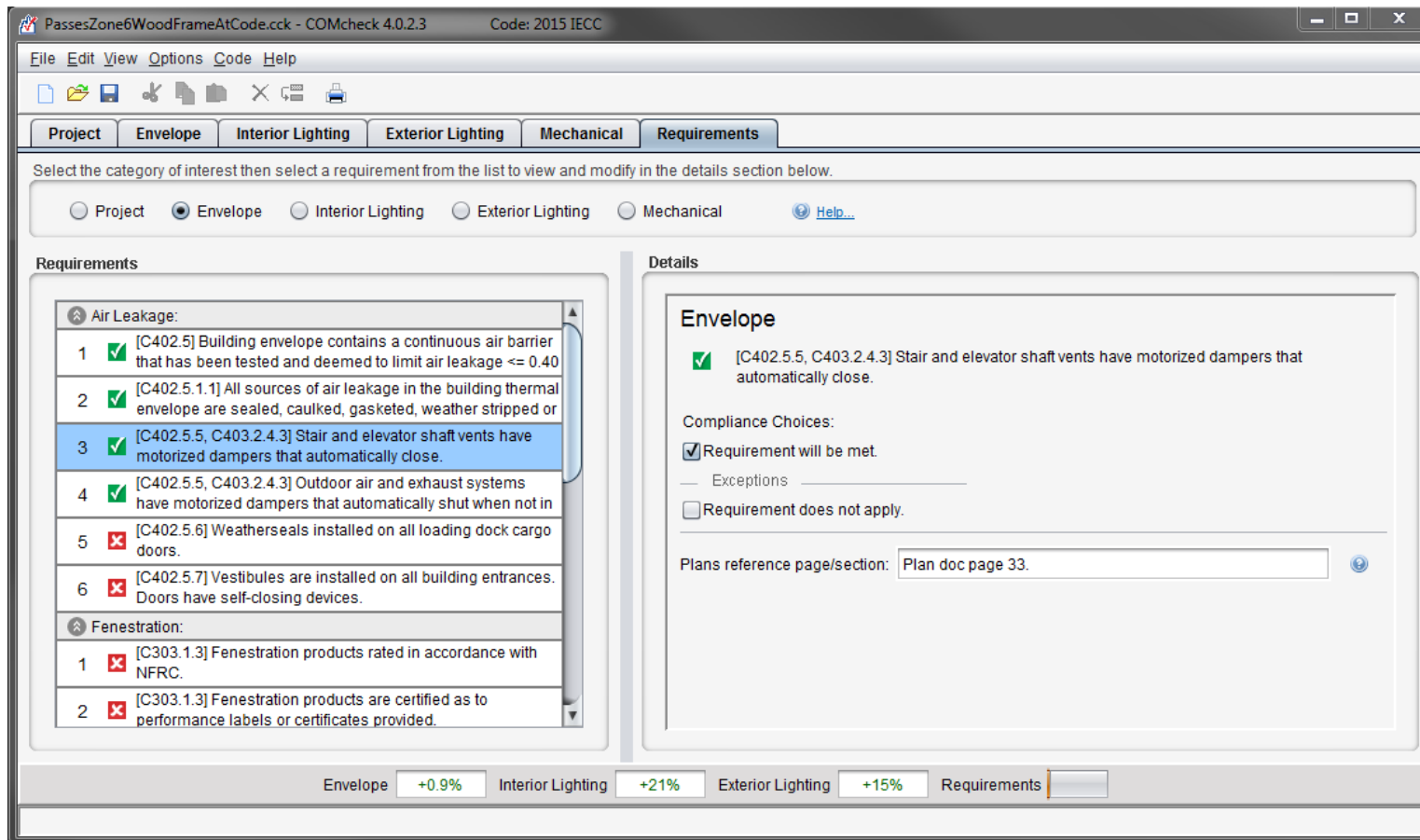
Motor Nameplate HP

Proposed Max. Allowed



# Requirements Tab – Goals

- ▶ Ensure user is aware of applicable mandatory requirements and addresses each in the software
- ▶ Provide better documentation for code officials



# Requirements Tab – How it Works

- ▶ For each requirement, the user
  - Certifies that a code requirement is
    - Met
    - Exempt
    - or does not apply
  - Notes how compliance for applicable requirements are documented
- ▶ This information is shown on the report in the “Comments/ Assumptions” column of the Inspection Checklist


- ▶ File → View / Print Report
- ▶ Choices, choose any or all
  - Envelope Compliance Certificate
  - Interior Lighting Compliance Certificate
  - Exterior Lighting Compliance Certificate
  - Mechanical Compliance Certificate
- ▶ First pages are the Compliance Certificate
- ▶ Follow-on pages are the Inspection Checklists by phase of inspection
  - Plan Review
  - Footing/Foundation
  - Rough-in
  - Final

# Report – Compliance Certificate

compliance-report-20151207\_132650\_655.pdf - Adobe Reader

File Edit View Window Help

Open [Icons] 1 / 19 88.5% [Icons] Tools Fill & Sign Comment



## COMcheck Software Version 4.0.2.3 Envelope Compliance Certificate

**Project Information**

Energy Code: 2015 IECC  
 Project Title: Project Demo  
 Location: Bozeman, Montana  
 Climate Zone: 6b  
 Project Type: New Construction  
 Vertical Glazing / Wall Area: 30%  
 Permit Date: 998877  
 Permit No. XYZ

Construction Site: 123 Main St.  
Mainville, MT 59515

Owner/Agent: John Doe  
Acme Real Estate Agency  
321 Example Ave.  
Example, MT 99522  
444-333-2222  
example@example.com

Designer/Contractor: Jane Contractor  
Excel Contractors, Inc.  
444 Contractor Ave.  
Contractorville, MT 99999  
999-999-9999  
email@email.com

**Building Area** **Floor Area**

1-Law library (Court House) : Nonresidential	10000
--	-------

**Additional Efficiency Package**

On-site Renewable Energy

**Envelope Assemblies**

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor <sub>req</sub>
Roof: Insulation Entirely Above Deck, [Bldg. Use 1 - Law library]	10000	—	30.0	0.032	0.032
Slab floor: Slab-On-Grade/Unheated, Vertical 2 ft., [Bldg. Use 1 - Law library] (c)	400	—	10.0	0.550	0.550
<b>NORTH</b>					
Exterior Wall 1: Wood-Framed, 24" o. c., [Bldg. Use 1 - Law library]	1000	13.0	7.5	0.050	0.051
Window 1: Metal Frame:Fixed, Perf. Specs.: Product ID AX321, SHGC 0.40, VT 0.44, [Bldg. Use 1 - Law library] (b)	300	—	—	0.360	0.360
<b>EAST</b>					
Exterior Wall 2: Wood-Framed, 24" o. c., [Bldg. Use 1 - Law library]	1000	13.0	7.5	0.050	0.051
Window 2 in Wall2: Metal Frame:Fixed, Perf. Specs.: Product ID AX321, SHGC 0.40, VT 0.44, [Bldg. Use 1 - Law library] (b)	300	—	—	0.360	0.360
<b>SOUTH</b>					
Exterior Wall 4: Wood-Framed, 24" o. c., [Bldg. Use 1 - Law library]	1000	13.0	7.5	0.050	0.051
Window 4 in wall 4: Metal Frame:Operable, Perf. Specs.: Product ID WWZ, SHGC 0.40, VT 0.44, [Bldg. Use 1 - Law library] (b)	300	—	—	0.290	0.430
<b>WEST</b>					
Exterior Wall 3: Wood-Framed, 24" o. c., [Bldg. Use 1 - Law library]	1000	13.0	7.5	0.050	0.051
Window 3 in wall 3: Metal Frame:Fixed, Perf. Specs.: Product ID AX321, SHGC 0.40, VT 0.44, [Bldg. Use 1 - Law library] (b)	300	—	—	0.360	0.360

Project Title: Project Demo Report date: 12/07/15  
 Data filename: C:\Users\ld3A870\BECPI\CheckApps\trunk\Engine\TestCases\2015Tests\Demo Page 1 of 19  
 files\PassesZone6WoodFrameAtCode.cck

# Reports – Compliance Certificate (cont)



COMcheck Software Version 4.0.2.3

## Envelope Compliance Certificate

### Project Information

Energy Code: 2015 IECC  
 Project Title: Project Demo  
 Location: Bozeman, Montana  
 Climate Zone: 6b  
 Project Type: New Construction  
 Vertical Glazing / Wall Area: 30%  
 Permit Date: 998877  
 Permit No. XYZ

Construction Site:  
 123 Main St.  
 Mainville, MT 59515

Owner/Agent:  
 John Doe  
 Acme Real Estate Agency  
 321 Example Ave.  
 Example, MT 99522  
 444-333-2222  
 example@example.com

Designer/Contractor:  
 Jane Contractor  
 Excel Contractors, Inc.  
 444 Contractor Ave.  
 Contractorville, MT 99999  
 999-999-9999  
 email@email.com

Building Area	Floor Area
1-Law library (Court House) : Nonresidential	10000

### Additional Efficiency Package

On-site Renewable Energy

### Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U- Factor <sup>(a)</sup>
Roof: Insulation Entirely Above Deck, [Bldg. Use 1 - Law library]	10000	—	30.0	0.032	0.032
Slab floor: Slab-On-Grade:Unheated, Vertical 2 ft., [Bldg. Use 1 - Law library] (c)	400	—	10.0	0.550	0.550
<b>NORTH</b>					
Exterior Wall 1: Wood-Framed, 24" o.c., [Bldg. Use 1 - Law library]	1000	13.0	7.5	0.050	0.051
Window 1: Metal Frame:Fixed, Perf. Specs.: Product ID AX321, SHGC 0.40, VT 0.44, [Bldg. Use 1 - Law library] (b)	300	—	—	0.360	0.360

Verify energy code,  
location, and  
construction type  
specifications

# Reports – Compliance Certificate (cont)

## Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U- Factor <sup>(a)</sup>
Roof: Insulation Entirely Above Deck, [Bldg. Use 1 - Law library]	10000	—	30.0	0.032	
Slab floor: Slab-On-Grade:Unheated, Vertical 2 ft., [Bldg. Use 1 - Law library] (c)	400	—	10.0	0.550	
<b><u>NORTH</u></b>					
Exterior Wall 1: Wood-Framed, 24" o .c., [Bldg. Use 1 - Law library]	1000	13.0	7.5	0.050	
Window 1: Metal Frame:Fixed, Perf. Specs.: Product ID AX321, SHGC 0.40, VT 0.44, [Bldg. Use 1 - Law library] (b)	300	—	—	0.360	
<b><u>EAST</u></b>					
Exterior Wall 2: Wood-Framed, 24" o .c., [Bldg. Use 1 - Law library]	1000	13.0	7.5	0.050	
Window 2 in Wall2: Metal Frame:Fixed, Perf. Specs.: Product ID AX321, SHGC 0.40, VT 0.44, [Bldg. Use 1 - Law library] (b)	300	—	—	0.360	0.360

Verify area, insulation R-values, and U-factors consistent with plans

Verify Compliance Statement is Signed

### Envelope PASSES: Design 1% better than code

#### Envelope Compliance Statement

*Compliance Statement:* The proposed envelope design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed envelope systems have been designed to meet the 2015 IECC requirements in COMcheck Version 4.0.2.3 and to comply with the mandatory requirements listed in the Inspection Checklist.

Name - Title \_\_\_\_\_

Signature \_\_\_\_\_

Date \_\_\_\_\_



## COMcheck Software Version 4.0.2.3

# Inspection Checklist

Energy Code: 2015 IECC

Requirements: 7.0% were addressed directly in the COMcheck software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
C103.2 [PR1] <sup>1</sup>	Plans and/or specifications provide all information with which compliance can be determined for the building envelope and document where exceptions to the standard are claimed.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.  <b>Location on plans/spec:</b> Plan doc page 21, section 3a
C103.2 [PR2] <sup>1</sup>	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the mechanical systems and equipment and document where exceptions to the standard are claimed. Load calculations per acceptable engineering standards and handbooks.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	

# Envelope Inspection Checklist Example (cont)

Code  
Section #

Value from  
Plans

Compliance



Section # & Req.ID	Footing / Foundation Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
5.5.3.3 [FO1] <sup>2</sup>	Below-grade wall insulation R-value.	R-_____	R-_____	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	See the Envelope Assemblies table for values.



Inspection  
Type and  
Req. Title



Value from  
Field



Plans ref.,  
Insp.  
comments



## Building Energy Codes Program

Building Energy Codes


 

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U.S. Department of Energy » Energy Efficiency and Renewable Energy » Building Technologies Office » BECP Home

DEVELOPMENT  
ADOPTION  
COMPLIANCE  
REGULATIONS  
RESOURCE CENTER



**Energy Code Commentator Training Series presents: COMcheck Basics**  
The next webinar in the Energy Code Commentator Training Series, **COMcheck Basics**, is scheduled for June 9, at 1 p.m. (EDT). This webinar will provide an overview of the basic functions of the COMcheck software. [Learn more...](#)

### HIGHLIGHTS

- [IECC Prototype Models for Commercial Buildings](#)
- [2016 National Energy Codes Conference](#)
- [DOE Proposals for the 2018 IECC](#)
- [Upcoming Training Events & Available Resources](#)
- [Residential Energy Code Field Study](#)

Site Map | Printable Version |

### Popular Links


Tools

[COMcheck](#) [REScheck](#)

Technical Assistance

[Help Desk](#)

Status of State Energy Codes

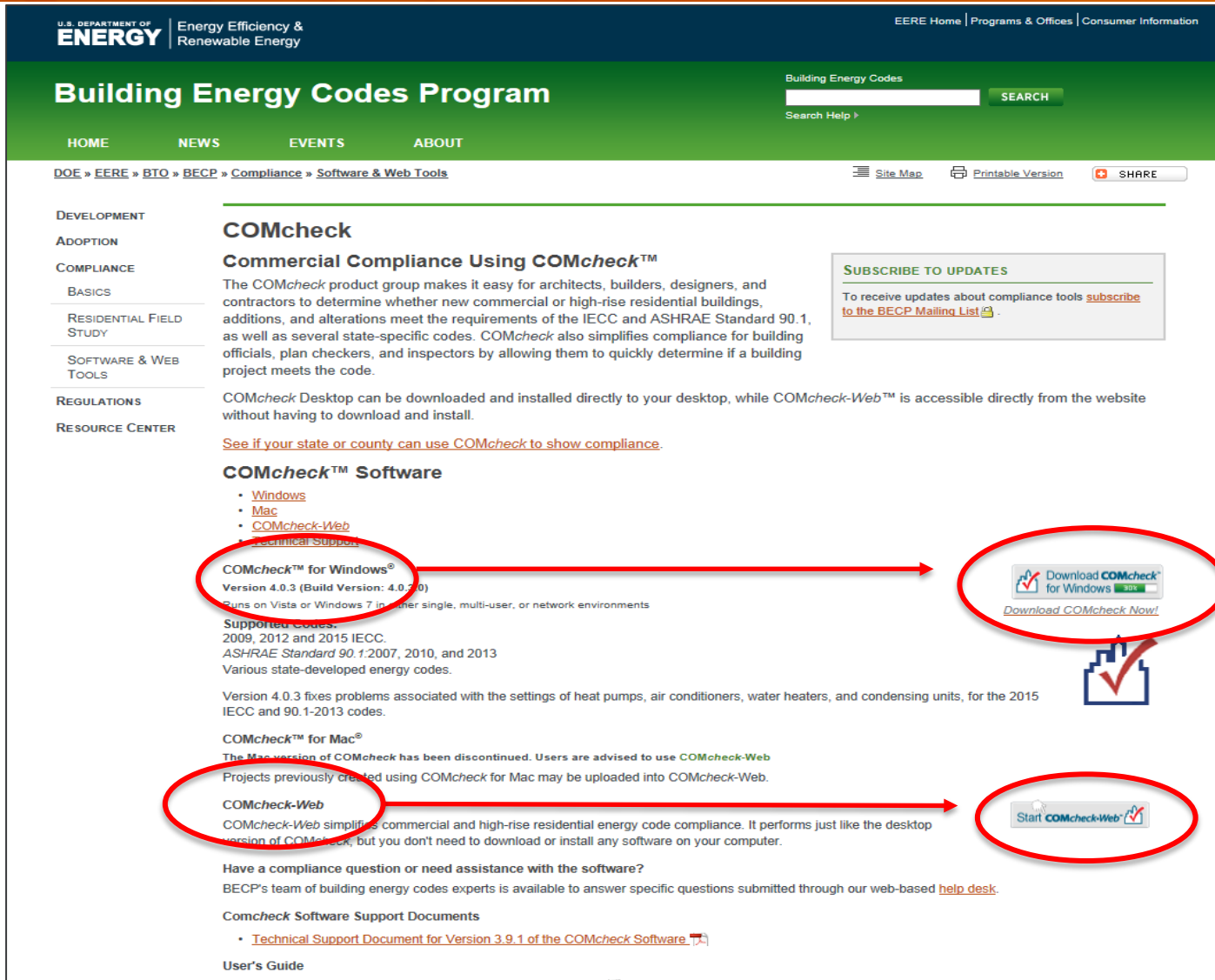


News

- [Where Can We Find Even More Savings? Hint – Focus on the "Other"](#) [↗](#)  
Source: [ASE blog post](#), posted: 04.04.2016
- [DOE Releases Firsts Annual National Energy Employment Analysis](#) [↗](#)  
Source: [Energy.gov](#), posted: 03.24.2016
- [New studies are showing what we already know: energy efficiency keeps electricity affordable and reduces environmental compliances costs](#) [↗](#)  
Source: [ACEEE](#), posted: 03.18.2016
- [Looking Forward: Lessons in Energy Efficiency from Canada](#) [↗](#)  
Source: [TriplePundit](#), posted: 03.02.2016
- [Better Buildings Summit, May 9-11](#) [↗](#)  
Source: [Better Buildings Initiative](#)
- [EERE News and Blog](#) [↗](#)  
Source: [Energy.gov](#)

Social Media





The screenshot shows the COMcheck website interface. At the top, there is a navigation bar with 'U.S. DEPARTMENT OF ENERGY' and 'Energy Efficiency & Renewable Energy' on the left, and 'EERE Home | Programs & Offices | Consumer Information' on the right. Below this is a green header with 'Building Energy Codes Program' and a search box. A secondary navigation bar contains 'HOME', 'NEWS', 'EVENTS', and 'ABOUT'. A breadcrumb trail reads 'DOE » EERE » BTO » BECP » Compliance » Software & Web Tools'. On the left is a sidebar menu with categories like 'DEVELOPMENT', 'ADOPTION', 'COMPLIANCE', 'RESIDENTIAL FIELD STUDY', 'SOFTWARE & WEB TOOLS', 'REGULATIONS', and 'RESOURCE CENTER'. The main content area features a 'COMcheck' section with a 'Commercial Compliance Using COMcheck™' sub-header. It includes a 'SUBSCRIBE TO UPDATES' box, a paragraph about the product group, and information about desktop and web versions. Two red circles highlight 'COMcheck™ for Windows®' and 'COMcheck-Web', with arrows pointing to their respective download and start buttons. The 'COMcheck™ for Windows®' button is labeled 'Download COMcheck for Windows 4.0.3' and 'Download COMcheck Now!'. The 'COMcheck-Web' button is labeled 'Start COMcheck-Web'. A 'Have a compliance question or need assistance with the software?' section is also visible.

# U.S. DOE: BECP Resources

- ▶ Compliance software
  - ▶ Technical support
  - ▶ Code notes
  - ▶ Publications
  - ▶ Resource guides
  - ▶ Training materials
- [www.energycodes.gov](http://www.energycodes.gov)

Row	Component	Assembly	Orientation	Building Area Type	Fenestration Details	Construction Details	Gross Area	Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor
1	Roof	Insulation Entirely Above Deck		1 - Retail ( Nonresidential...			10000 ft <sup>2</sup>		38	0.026
2	Ext. Wall	Wood-Framed, 24in. o.c.								
3	Window	Vinyl Frame: Fixed	North	1 - Retail ( Nonresidential...			2600 ft <sup>2</sup>	20	10	0.037
4	Door	Insulated Metal								

U.S. DEPARTMENT OF ENERGY  
Energy Efficiency & Renewable Energy  
BUILDING TECHNOLOGIES PROGRAM  
Building Energy Codes  
Resource Guide

U.S. DEPARTMENT OF ENERGY  
Energy Efficiency & Renewable Energy  
BUILDING TECHNOLOGIES PROGRAM  
ANSI/ASHRAE/IES Standard 90.1-2010 & 2012 IECC  
Insulation Requirements in Commercial Buildings for Mechanical and Service Hot-Water Piping  
The intent of the pipe insulation requirements is to reduce temperature changes while fluids are being transported through piping associated with heating, cooling or service hot water (SHW) systems, thereby saving energy and reducing operating costs.

U.S. DEPARTMENT OF ENERGY  
Energy Efficiency & Renewable Energy  
BUILDING TECHNOLOGIES PROGRAM  
Building Energy Codes Resource Guide:  
COMMERCIAL BUILDINGS  
for Architects

U.S. DEPARTMENT OF ENERGY  
Energy Efficiency & Renewable Energy  
BUILDING TECHNOLOGIES PROGRAM  
Building Energy Codes  
Resource Guide  
FOR POLICY MAKERS

# THANK YOU!

Building Energy Codes Program  
[www.energycodes.gov](http://www.energycodes.gov)

BECP help desk  
<http://www.energycodes.gov/resource-center/help-desk>